



## Cancer Facts

### Complementary And Alternative Medicine

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#### Questions and Answers About Coenzyme Q<sub>10</sub>

Complementary and alternative medicine (CAM)—also referred to as *integrative* medicine—includes a broad range of healing philosophies, approaches, and therapies. A therapy is generally called *complementary* when it is used *in addition to* conventional treatments; it is often called *alternative* when it is used *instead of* conventional treatment. (Conventional treatments are those that are widely accepted and practiced by the mainstream medical community.) Depending on how they are used, some therapies can be considered either complementary or alternative. Complementary and alternative therapies are used in an effort to prevent illness, reduce stress, prevent or reduce side effects and symptoms, or control or cure disease.

Unlike conventional treatments for cancer, complementary and alternative therapies are often not covered by insurance companies. Patients should check with their insurance provider to find out about coverage for complementary and alternative therapies.

Cancer patients considering complementary and alternative therapies should discuss this decision with their doctor or nurse, as they would any therapeutic approach, because some complementary and alternative therapies may interfere with their standard treatment or may be harmful when used with conventional treatment.

#### 1. What is Coenzyme Q<sub>10</sub>?

Coenzyme Q<sub>10</sub> (also known as CoQ<sub>10</sub>, Q<sub>10</sub>, vitamin Q<sub>10</sub>, ubiquinone, or ubidecarenone) is a compound that is made naturally in the body. A coenzyme is a substance needed for the proper functioning of an enzyme, a protein that speeds up the rate at which chemical reactions take place in the body. The Q and the 10 in coenzyme Q<sub>10</sub> refer to parts of the compound's chemical structure.



Coenzyme Q<sub>10</sub> is used by cells to produce energy needed for cell growth and maintenance. It is also used by the body as an antioxidant. An antioxidant is a substance that protects cells from chemicals called free radicals. Free radicals are highly reactive chemicals that can damage important parts of cells, including deoxyribonucleic acid (DNA). (DNA is a molecule inside cells that carries genetic information and passes it from one generation to the next.) This damage may play a role in the development of cancer.

Coenzyme Q<sub>10</sub> is found in most body tissues. The highest amounts are found in the heart, liver, kidneys, and pancreas. The lowest amounts are found in the lungs. Tissue levels of coenzyme Q<sub>10</sub> decrease as people get older.

**2. What is the history of the discovery and use of coenzyme Q<sub>10</sub> as a complementary or alternative treatment for cancer?**

Coenzyme Q<sub>10</sub> was first identified in 1957. Its chemical structure was determined in 1958. Interest in coenzyme Q<sub>10</sub> as a potential treatment for cancer began in 1961, when a deficiency of the enzyme was noted in the blood of cancer patients. Low blood levels of coenzyme Q<sub>10</sub> have been found in patients with myeloma, lymphoma, and cancers of the breast, lung, prostate, pancreas, colon, kidney, and head and neck.

Studies have yielded information about how coenzyme Q<sub>10</sub> works in the body to produce energy and act as an antioxidant. Some studies have suggested that coenzyme Q<sub>10</sub> stimulates the immune system and increases resistance to disease. In part because of this, researchers have theorized that coenzyme Q<sub>10</sub> may be useful as an adjuvant therapy for cancer. (Adjuvant therapy is treatment given following the primary treatment to enhance the effectiveness of the primary treatment.)

**3. How is coenzyme Q<sub>10</sub> administered?**

Coenzyme Q<sub>10</sub> is usually taken by mouth as a pill (tablet or capsule). It may also be given by injection into a vein (IV). In animal studies, coenzyme Q<sub>10</sub> is given by injection.

**4. Have any preclinical (laboratory and animal) studies been conducted using coenzyme Q<sub>10</sub>?**

Laboratory studies of coenzyme Q<sub>10</sub> have focused on describing its chemical structure and how it works in the body. Animal studies have found that coenzyme Q<sub>10</sub> stimulated the immune system and increased resistance to disease. Coenzyme Q<sub>10</sub> helped to protect the hearts of animals given the anticancer drug doxorubicin, which can cause damage to the heart muscle.

**5. Have any clinical trials (research studies in humans) been conducted with coenzyme Q<sub>10</sub>?**

The promising results from animal studies of coenzyme Q<sub>10</sub> and the anticancer drug doxorubicin led researchers to test coenzyme Q<sub>10</sub> in a randomized clinical trial with 20 patients. (A randomized clinical trial is a study in which the participants are assigned by chance to separate groups that compare different treatments; neither the researchers nor the participants can choose which group.) The researchers examined whether coenzyme Q<sub>10</sub> would protect the heart from the damage caused by doxorubicin. The results of this trial and others have confirmed that coenzyme Q<sub>10</sub> decreases the effects of doxorubicin on the heart. However, no report of a randomized clinical trial of coenzyme Q<sub>10</sub> as a treatment for cancer has been published in a peer-reviewed, scientific journal.

**6. Have other studies of coenzyme Q<sub>10</sub> been conducted in people?**

Three other small studies were conducted using coenzyme Q<sub>10</sub> as a dietary supplement in patients undergoing conventional cancer treatment. In these studies, the researchers explored the potential use of coenzyme Q<sub>10</sub> as an adjuvant therapy for cancer.

- The first study, which was conducted in Denmark, involved 32 breast cancer patients. All of the participants received coenzyme Q<sub>10</sub> and several other dietary supplements, in addition to their standard treatment. Six of the patients were reported to show some signs of remission (disappearance of the signs and symptoms of cancer). However, the data were not complete, and information that suggested remission was presented for only three of the six patients. All of the participants reported decreased use of painkillers, improved quality of life, and absence of weight loss during treatment.
- In a followup study, one new patient and one of the patients who had a reported remission were treated with high doses of coenzyme Q<sub>10</sub> for 3 to 4 months. Both of the patients had breast cancer remaining after surgery. After the period of high-dose coenzyme Q<sub>10</sub> supplementation, both patients appeared to experience complete regression (decrease in the size or extent) of their remaining cancer. However, it is not known which of the six patients with a reported remission in the first study took part in the followup study.
- In a third study conducted by the same researchers, three breast cancer patients were given high-dose coenzyme Q<sub>10</sub> and followed for 3 to 5 years. One patient had complete remission of cancer that had spread to the liver, another had remission of cancer that had spread to the chest wall, and the third had no evidence of breast cancer remaining after surgery.

It is important to note that problems with the design of these studies may have influenced their results. For example, the studies did not have control groups (all

patients received coenzyme Q<sub>10</sub>), and there may have been differences in the characteristics of patients who were selected for the followup study and those who were not. Other factors that may have affected the results include the following: the participants received a variety of supplements in addition to coenzyme Q<sub>10</sub>, and they received standard treatment either during or just before coenzyme Q<sub>10</sub> supplementation. Therefore, it is impossible to determine whether any of the beneficial results was directly related to coenzyme Q<sub>10</sub> therapy.

There have also been anecdotal reports that coenzyme Q<sub>10</sub> has increased the survival of patients with cancers of the pancreas, lung, colon, rectum, and prostate. (Anecdotal reports are incomplete descriptions of the medical and treatment history of one or more patients.) The patients described in these reports also received treatments other than coenzyme Q<sub>10</sub>, including chemotherapy, radiation therapy, and surgery.

**7. Have any side effects or risks been reported from coenzyme Q<sub>10</sub>?**

No serious side effects have been reported from the use of coenzyme Q<sub>10</sub>. Some patients using coenzyme Q<sub>10</sub> have experienced mild insomnia (inability to sleep), elevated levels of liver enzymes, rashes, nausea, and upper abdominal pain. Other reported side effects have included dizziness, visual sensitivity to light, irritability, headache, heartburn, and fatigue.

Patients should talk with their health care provider about possible interactions between coenzyme Q<sub>10</sub> and prescription drugs they may be taking. Certain drugs, such as those that are used to lower cholesterol or blood sugar levels, may reduce the effects of coenzyme Q<sub>10</sub>. Coenzyme Q<sub>10</sub> may also alter the body's response to warfarin (a drug that prevents the blood from clotting) and insulin.

**8. Are there any other potential drawbacks to taking coenzyme Q<sub>10</sub>?**

As noted in question 1, coenzyme Q<sub>10</sub> is used by the body as an antioxidant. Antioxidants protect cells from free radicals, which are highly reactive chemicals that can damage cells. Some conventional cancer therapies, such as anticancer drugs and radiation treatment, kill cancer cells in part by causing free radicals to form. Researchers are studying whether using coenzyme Q<sub>10</sub> along with conventional therapies is positive (i.e., does not interfere with the effects of the conventional therapies, or increases the therapies' beneficial effects on cancer cells while protecting normal cells) or negative (i.e., interferes with the therapeutic effects).

**9. Has the Food and Drug Administration (FDA) approved coenzyme Q<sub>10</sub> for use in the United States?**

Several companies distribute coenzyme Q<sub>10</sub> as a dietary supplement. In the United States, dietary supplements are regulated as foods, not drugs. This means that evaluation and approval by the FDA are not required before marketing, unless

specific health claims are made about the supplement. It should be noted that, because dietary supplements are not formally reviewed for manufacturing consistency, there may be variation in the composition of the supplement from one batch to another.

Also, to conduct clinical drug research with humans in the United States, researchers must file an Investigational New Drug (IND) application with the FDA. Because an IND application is highly confidential, it is not known whether one has been submitted or approved for the study of coenzyme Q<sub>10</sub> as a treatment for cancer.

**10. When considering complementary and alternative therapies, what questions should patients ask their health care provider?**

- What benefits can be expected from this therapy?
- What are the risks associated with this therapy?
- Do the known benefits outweigh the risks?
- What side effects can be expected?
- Will the therapy interfere with conventional treatment?
- Is this therapy part of a clinical trial? If so, who is sponsoring the trial?
- Will the therapy be covered by health insurance?

**11. How are complementary and alternative approaches evaluated?**

It is important that the same scientific evaluation which is used to assess conventional approaches be used to evaluate complementary and alternative therapies. A number of medical centers are evaluating complementary and alternative therapies by developing clinical trials to test them.

More information about how CAM approaches are evaluated can be found in the National Cancer Institute (NCI) fact sheet *Questions and Answers About Complementary and Alternative Medicine in Cancer Treatment*. This fact sheet can be accessed at [http://cis.nci.nih.gov/fact/9\\_14.htm](http://cis.nci.nih.gov/fact/9_14.htm) on the Internet, or by calling the Cancer Information Service (CIS) at 1-800-422-6237.

**12. How can patients and their health care providers learn more about complementary and alternative therapies?**

Patients and their doctor or nurse can learn about complementary and alternative therapies from the following Government agencies:

The **National Center for Complementary and Alternative Medicine** (NCCAM) at the National Institutes of Health (NIH) facilitates research and evaluation of complementary and alternative practices, and provides information about a variety of approaches to health professionals and the public.

NCCAM Clearinghouse  
Post Office Box 7923  
Gaithersburg, MD 20898-7923  
Telephone: 1-888-644-6226 (toll free)  
301-519-3153 (for International callers)  
TTY (for deaf and hard of hearing callers): 1-866-464-3615  
Fax: 1-866-464-3616  
E-mail: [info@nccam.nih.gov](mailto:info@nccam.nih.gov)  
Web site: <http://nccam.nih.gov>

**NCCAM** and the **NIH National Library of Medicine** (NLM) jointly developed **CAM on PubMed**, a free and easy-to-use search tool for finding CAM-related journal citations. As a subset of the NLM's PubMed bibliographic database, CAM on PubMed features more than 230,000 references and abstracts for CAM-related articles from scientific journals. This database also provides links to the Web sites of over 1,800 journals, allowing users to view articles in full-text. (A subscription or other fee may be required to access full-text articles.) CAM on PubMed is available through the NCCAM Web site at <http://nccam.nih.gov>. It can also be accessed at <http://www.ncbi.nlm.nih.gov/PubMed> by selecting "Limits" and choosing "Complementary Medicine" as a subset.

The **NCI Office of Cancer Complementary and Alternative Medicine** (OCCAM) coordinates the activities of the NCI in the area of complementary and alternative medicine (CAM). OCCAM supports CAM cancer research and provides information about cancer-related CAM to health providers and the general public via its Web site <http://cancer.gov/cam> on the Internet.

The **Food and Drug Administration** (FDA) regulates drugs and medical devices to ensure that they are safe and effective.

Food and Drug Administration  
5600 Fishers Lane  
Rockville, MD 20857  
Telephone: 1-888-463-6332 (toll free)  
Web site: <http://www.fda.gov/>

The **Federal Trade Commission** (FTC) enforces consumer protection laws. Publications available from the FTC include:

- "Who Cares: Sources of Information About Health Care Products and Services"
- "Fraudulent Health Claims: Don't Be Fooled"

Consumer Response Center  
Federal Trade Commission  
CRC-240  
Washington, DC 20580  
Telephone: 1-877-FTC-HELP (1-877-382-4357) (toll free)  
TTY (for deaf and hard of hearing callers): 202-326-2502  
Web site: <http://www.ftc.gov/>

*The information in this fact sheet was adapted from the NCI's PDQ® summary Coenzyme Q<sub>10</sub>. Full reference citations are listed at the end of the PDQ summary, which can be accessed at <http://cancernet.nci.nih.gov/treatment/cam.shtml> on the Internet. The PDQ summary can also be obtained by calling the Cancer Information Service (CIS). The CIS, a national information and education network, is a free public service of the NCI, the Nation's primary agency for cancer research. The toll-free phone number for the CIS is 1-800-4-CANCER (1-800-422-6237). For deaf and hard of hearing callers with TTY equipment, the number is 1-800-332-8615.*

*The information in this fact sheet is not presented as a substitute for informed medical advice. If you have any questions about your individual medical situation, please contact your doctor.*

**This fact sheet was reviewed on 10/10/01**